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EXAMINER	
HE, JIALONG	

ART UNIT	PAPER NUMBER
4173	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/826,469	REZNIK, YURIY A.	
	Examiner	**Art Unit**	
	JIALONG HE	4173	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _16 April 2004_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-31_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-31_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _12 November 2004_ is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _11/04/2004_.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 11/04/2004 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

2. New corrected drawing in compliance with 37 CFR 1.121(d) is required in this application because in Figure 1 #118 and #122, the contents are not readable.

Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-4, 7-10, 12-15, and 19-31 are rejected under 35 U.S.C. 102(b) as being anticipated by Robinson ("Shorten: simple lossless and near-lossless waveform compression", 1994).

Regarding claim 1, Robinson discloses a method comprising:

applying a prediction filter to a unit of audio signal data (**page 2, section 3**);

determining a distribution substantially representative of residual data generated as part of said applying of a prediction filter to the unit of audio signal data (**page 4, section 3.3, figure 2 and 3**); and

transmitting in substance the unit of audio signal data to a recipient (**page 11, shorten command line, the compressed data can be saved to a file or piped out to another program**), utilizing the determined distribution to assist in reducing the amount of data having to be transmitted (**page 4, section 3.3, residual coding**).

Regarding claim 2, which depends on claim 1, Robinson discloses all limitations of claim 1 and also discloses the method further comprises receiving a portion of a stream of audio signal data (**page 2, signal s(t)**); and partitioning the stream of the audio signal data into a plurality of units of audio data (**page 3, section 3.1, blocking and time frame**).

Regarding claim 3, which depends on claim 2, Robinson discloses all limitations of claim 2 and also discloses the partitioning comprises partitioning the stream of the

audio signal data into a plurality of fixed-size units of audio signal data (**page 3, section 3.1, the default frame size is 256 samples**).

Regarding claim 4, which depends on claim 2, Robinson discloses all limitations of claim 2 and also discloses the method further comprises:

selecting one of the plurality of units of audio signal data partitioned from the portion of the stream of audio signal data; performing said applying, determining and transmitting operations of claim 1 for the selected unit of audio signal data; and repeating the selecting and performing until all units of the partitioned audio signal data have been transmitted in substance to the recipient (**page 1-10, the utility program "shorten" compresses a signal on frame-by-frame base until all frames are processed and saves the compressed signal in a file**).

Regarding claim 7, which depends on claim 1, Robinson discloses all limitations of claim 1 and also discloses the method further comprises transmitting a plurality of parameters of the prediction filter to the recipient (**page 3, section 3.2, prediction coefficients a_i**).

Regarding claim 8, which depends on claim 7, Robinson discloses all limitations of claim 7 and also discloses the applying comprises applying a linear prediction filter having a prediction order p, and prediction coefficients $a_1, \ldots, a_p$; and the transmitting of the parameters of the prediction filter comprises transmitting the prediction order p,

information about quantization step size used to quantize prediction coefficients, and quantized versions of the prediction coefficients $a_1, \ldots, a_p$ (**page 11, "shorten" command line option "-p prediction order", page 7, section 3.2, the prediction coefficients, a_i, are quantized**)

Regarding claim 9, which depends on claim 1, Robinson discloses all limitations of claim 1 and also discloses the residual data comprises a plurality of residual samples (**page 4, section 3.3, samples in prediction residual**); the determining of a distribution comprises determining a plurality of statistical measures including a variance of the residual samples or an estimate of the variance (**figure 2, Gaussian and Laplacian distribution functions of residuals, both are characterized by mean and variance**); forming a residual data distribution descriptor based at least in part on the determined variance of the residual samples or its estimate, the distribution descriptor identifying the substantially representative distribution to the recipient (**section 3.3, the problem of residual coding is therefore to find an appropriate form for the probability density function (PDF), mean and variance of a Gaussian distribution function (**a residual data distribution descriptor**)**); and the transmitting comprises transmitting the residual data distribution descriptor to the recipient (**page 5, Huffman code for this distribution**).

Regarding claim 10, which depends on claim 9, Robinson discloses all limitations of claim 9 and also discloses the determining of the statistical measures further

comprises determining a mean of the residual samples; and the forming of the residual data distribution descriptor is further based on the determined mean of the residual samples (**figure 2, residual signal is modeled by Gaussian or Laplacian distribution function, both are characterized by mean and variance**).

Regarding claim 12, which depends on claim 1, Robinson discloses all limitations of claim 1 and also discloses the residual data comprises a plurality of residual samples (**page 4, section 3.3, samples in prediction residual**); the method further comprises determining a number of least significant bits (LSB) of each residual sample to be sent to the recipient (**page 5, the *n* low order bits (**least significant bits**) then follow, as in the example in table 1**); and the transmitting comprises transmitting to the recipient how many LSB of each residual sample will be transmitted to the recipient and the appropriate number of LSB of each of the residual samples (**page 5, table 1**).

Regarding claim 13, which depends on claim12, Robinson discloses all limitations of claim 12. Robinson also discloses the method further comprises determining a reconstructed inverse-quantized mean value of the residual samples, and the determining of the LSB of each residual sample to be sent to the recipient is performed based at least in part on the determined reconstructed inverse-quantized mean value of the residual samples (**page 3, section 3.2, on each iteration the mean squared value of the prediction residual is calculated and this is used to computer the expected number of bits needed to code the residual signal**).

Regarding claim 14, which depends on claim 1, Robinson discloses all limitations of claim 1 and also discloses the residual data comprises a plurality of residual samples, each having a plurality of data bits (**page 4, section 3.3, samples in prediction residual, page 5, table 1, residual samples have a plurality of data bits**); the method further comprises encoding the most significant bits (MSB) of each of the residual samples, employing codes constructed using the determined substantially representative distribution (**page 5, Huffman code for this distribution**); and the transmitting comprises transmitting the encoded MSB of the residual samples to the recipient (**page 5, the high order bits (**most significant bits**) are treated as an integers**).

Regarding claim 15, which depends on claim 14, Robinson discloses all limitations of claim 14 and also discloses the method further comprises constructing the codes using the distribution, the constructed codes being Huffman codes (**page 5, Huffman code for this distribution**).

Regarding 19, Robinson discloses an apparatus (**page 9, Shorten running on SGI workstation**) comprising

a prediction filter (**page 2, equation 1**);

a transmission unit (**page 11, shorten command line, the compressed signal is saved to a file or sent to a program**); and

a control unit (**page 9, CPU in SGI workstation**) coupled to the prediction filter and the transmission unit, and adapted to apply the prediction filter to a unit of audio signal data to a recipient, and to use the transmission unit to transmit in substance the unit of audio signal data to the recipient, utilizing a distribution substantially representative of the residual data generated by the prediction filter to assist in reducing the amount of data having to be transmitted by the transmission unit (**page 4, section 3.3 residual coding**).

Regarding 20, which depends on claim 19, Robinson discloses all limitations of claim 19 and also discloses the control unit is adapted to use the transmission unit to transmit a plurality of parameters of the prediction filter to the recipient (**page 3, section 3.2, linear prediction, prediction coefficients, a_i, are quantized**).

Regarding 21, which depends on claim 19, Robinson discloses all limitations of claim 19 and also discloses the control unit is adapted to use the transmission unit to transmit a residual data distribution descriptor formed using at least some of a number statistical measures of the residual data, to the recipient, the distribution descriptor identifying the substantially representative distribution, and statistical measures are employed to identify the substantially representative distribution (**figure 2 and 3, residuals are modeled by a Gaussian or Laplacian distribution function, section 3.3, Huffman code for this distribution**).

Regarding 22, which depends on claim 19, Robinson discloses all limitations of claim 19 and also discloses the apparatus further comprises a computation unit coupled to the prediction filter and the control unit, and adapted to compute at least a plurality of statistical measures for the residual data generated by the prediction filter (**section 3.3, a computer with CPU estimates and models the distribution of a residual signal with a Gaussian function. The Gaussian function has a plurality of statistical measures, mean and variance**).

Regarding 23, which depends on claim 19, Robinson discloses all limitations of claim 19 and also discloses the residual data comprises a plurality of residual samples having data bits (**section 3.3, the samples of residual, a number is divided into a sign bit, the nth low order bits and the remaining high order bits**), and the control unit is adapted to use the transmission unit to transmit a plurality of the least significant bits (LSB) of each of the residual sample (**table 1, lower bits (**least significant bits**)**), to the recipient, the LSB of each of the residual sample transmitted being determined based at least in part on the determined substantially representative distribution (**page 5, Huffman code for this distribution**).

Regarding 24, which depends on claim 19, Robinson discloses all limitations of claim 19 and also discloses the residual data comprises a plurality of residual samples having data bits (**section 3.3, the samples of residual, a number is divided into a sign bit, the nth low order bits and the remaining high order bits**), and the control

unit is adapted to use the transmission unit to transmit a plurality of codes, encoding the most significant bits (MSB) of each of the residual sample (**page 5, the high order bits (**most significant bits**) are treated as an integer**), to the recipient, the codes being constructed based at least in part on the determined substantially representative distribution of the residual samples (**page 5, Huffman code for this distribution**).

Regarding 25, which depends on claim 24, Robinson discloses all limitations of claim 24 and also discloses the apparatus further comprises an encoder adapted to encode the MSB of each of the residual samples, using codes constructed from determined substantially representative distribution of the residual samples (**section 3.3, the problem of residual coding is therefore to find an appropriate form for the probability density function, Huffman code for this distribution, a number is divided into a sign bit, the nth low order bits and the remaining high order bits, the high order bits are treated as an integer**).

Regarding 26, Robinson discloses an apparatus (**page 9, Shorten running on SGI workstation**) comprising

a receiver unit (**computer read from a compressed file**);

a decoder coupled to the receiver unit (**page 14, shorten command line option –x, reconstruct the original file**); and

a control unit coupled to the receiver unit and the decoder, and adapted to use the decoder to recover a unit of audio signal data from an encoded transmission of the

unit of audio signal received by the receiver unit (**CPU running on a computer reads compressed data and reconstruct the original file**), the encoded transmission included encoded most significant bits (MSB) and unencoded least significant bits (LSB) of residual samples of residual data generated by a prediction filter applied to the unit of audio signal data (**section 3.3, residual coding, to form a code, a number is divided into a sign bit, the nth low order bits and the remaining high order bits**).

Regarding claim 27, which depends on claim 26, Robinson discloses all limitations of claim 26 and also discloses the encoded transmission further includes a distribution descriptor constructed based on statistical measures of the residual samples (**fig. 2, Gaussian distribution function of a residual signal**), and the control unit is further adapted to at least contribute in causing a inverse-quantized mean of the residual samples to be reconstructed (**page 3, section 3.2, on each iteration the mean squared value of the prediction residual is calculated and this is used to computer the expected number of bits needed to code the residual signal**).

Regarding claim 28, which depends on claim 26, Robinson discloses all limitations of claim 26 and also discloses the encoded transmission further includes a distribution descriptor constructed based on statistical measures of the residual samples, the distribution descriptor identifying the substantially representative distribution of the residual samples, and the control unit is further adapted to at least contribute in causing the substantially representative distribution to be available to the

decoder for use to decode a plurality of codes received by the receiver unit, the codes encoding the MSB of the residual samples (**section 3.3, residual coding**).

Regarding claim 29, Robinson discloses a system (**page 9, Shorten running on SGI workstation**) comprising:

a prediction filter (**page 2, equation 1**);

a transmission unit (**page 11, a compressed signal is saved to a file or sent to a program**);

a receiver unit (**computer reads from a file or from a program**);

a decoder unit (**page 14, shorten command line option –x, reconstruct the original file**); and

a control unit (**page 9, CPU in SGI workstation**) coupled to the prediction filter and the transmission unit, and adapted to apply the prediction filter to a first unit of audio signal data to a recipient, and to use the transmission unit to transmit in substance the first unit of audio signal data to the recipient, utilizing a distribution substantially representative of the residual data generated by the prediction filter to assist in reducing the amount of data having to be transmitted by the transmission unit, the control unit being further coupled to the receiver unit and the decoder unit, and adapted to use the decoder to recover a second unit of audio signal data from an encoded transmission of the second unit of audio signal received by the receiver unit, the encoded transmission included encoded most significant bits (MSB) and unencoded

least significant bits (LSB) of residual samples of residual data generated by a prediction filter applied to the second unit of audio signal data (**pages 1-10**).

Regarding claim 30, which depends on claim 29, Robinson discloses all limitations of claim 29 and also discloses a transceiver unit comprising the transmitter and receiver units (**a computer (SGI workstation) has input and output function**).

Regarding claim 31, which depends on claim 29, Robinson discloses all limitations of claim 29 and also discloses an encoder unit coupled to the prediction filter and the transmission unit, to encode the MSB of the first unit of audio signal data, the MSB of the first unit of audio signal data being determined based at least in part on statistical measures of the residual samples generated by the prediction filter, when applied to the first unit of audio signal data (**section 3.3, residual coding**).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson ("Shorten: simple lossless and near-lossless waveform compression", 1994)

in view of Hasegawa-Johnson et al. ("Speech coding: fundamentals and applications", December 2002, hereinafter referred to as Johnson).

Regarding claim 5, which depends on claim 2, Robinson discloses all limitations of claim 2. Robinson does not say further partitioning the selected one of the first plurality of units of audio signal data into a second plurality of units of audio signal data. Johnson discloses further partitioning a speech frame into sub-frames and processing each sub-frame (**Johnson, page 7, section 4.4, in order to take advantage of the slow rate of change of LPC coefficients without sacrificing the quality of the coded residual, most LPC-AS coders encode speech using a frame-subframe structure**). The combined teachings teach all limitations of this claim.

Robinson and Johnson are analogous art because they are from a similar field of endeavor in audio (speech) coding. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson's teaching with Johnson's teaching to further partition a frame of residual signal into subframes and process each subframes to take advantage of the slow rate of change of LPC coefficients without sacrificing the quality of the coded residual (**Johnson, page 7, section 4.4**).

Regarding claim 6, which depends on claim 5, Robinson and Johnson disclose all limitations of claim 5. Robinson further discloses repeating the further partitioning,

the selecting, the performing, and the repeating of claim 5, until all of the first plurality of units of audio signal data have been transmitted in substance to the recipient (**Robinson, page 1-10, shorten program compresses a signal on a frame-by-frame base until all frames are processed, Johnson teaches partitioning each frame into subframes and processing each subframe, combined teachings teach all limitations of this claim**).

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson ("Shorten: simple lossless and near-lossless waveform compression", 1994) in view of Nadon et al. (US PGPub. 2002/0094535, hereinafter referred to as Nodon).

Regarding claim 11, which depends on claim 9, Robinson discloses all limitations of claim 9, Robinson discloses modeling residual distribution with a Gaussian function, which inherently has mean and variance values (**Robinson, fig 2**). Robinson does not say the determining of the statistical measures further comprises determining at least a selected one of a skewness and a kurtosis of the residual samples. Nadon discloses measuring skewness and a kurtosis of a distribution (**Nadon, [0057]**).

Like mean and variance, skewness and kurtosis are standard measurements of a distribution function. Both Robinson and Nadon are measuring the distribution of data. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Robinson's teachings with Nadon's teaching to

include skewness and kurtosis measurements of the residual distribution to improve reliability and accuracy (**Nadon, Abstract**).

8. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson (“Shorten: simple lossless and near-lossless waveform compression”, 1994) in view of Kim (US Pat. 6, 094,636).

Regarding claims 16 and 18, which depends on 14, Robinson discloses all limitations of 14, Robinson discloses constructing codes using the Huffman algorithm but does not say constructing codes using the run-length or arithmetic algorithm. Kim discloses constructing codes using Huffman, run-length or arithmetic algorithm (**Kim, col. 8, lines 9-10**).

Robinson and Kim are analogous art because they are from a similar field of endeavor in audio coding. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson's teaching with Kim’s teaching to substitute the Hoffman coding algorithm with the run-length or arithmetic coding algorithm. All these coding algorithms are well known in variable length coding art. Simple substitution of one known element for another would obtain predictable results.

9. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson ("Shorten: simple lossless and near-lossless waveform compression", 1994) in view of Loh (US Pat. 3,694,813, hereinafter referred to as Loh).

Regarding claim 17, which depends on 14, Robinson discloses all limitations of 14, Robinson discloses constructing codes using the Huffman algorithm but does not say constructing codes using the Gilbert-Moore algorithm. Loh discloses constructing codes using the Gilbert-Moore algorithm (**Loh, col. 4, line 42**).

Robinson and Loh are analogous art because they are from a similar field of endeavor in compressing data. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Robinson's teaching with Loh's teaching to substitute the Hoffman coding algorithm with the Gilbert-Moore algorithm. All these coding algorithms are well known in variable length coding art. Simple substitution of one known element for another would obtain predictable results.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Levine (US Pat. 6,028,541) discloses a lossless data compression method with low complexity.

- Bruekers (US Pat. 6,041,302) discloses a lossless data compression/expansion using a Rice encoder/decoder.

- Hardwick (US PGPub. 2002/0147584) discloses a predictive lossless audio coder.

- Su et al. (US Pat. 6,014,622) disclose a low bit rate speech coder using adaptive open-loop subframe pitch lag estimation and vector quantization.

- Yatsuzuka (US Pat. 4,811,396) discloses a predictive coding system using - subframe for predictive residual.

- Yasunaga (US Pat. 6,330,534) discloses a predictive speech coder and decoder.

- Kojima et al. (US Pat. 4,853,780) disclose a method and apparatus for predictive coding.

- Akamine et al. (US Pat. 5,265,167) disclose a predictive speech coding and decoding apparatus.

- Herre et al. (US Pat. 6,424,939) disclose a method for coding an audio signal.

- Hans et al. ("Lossless compression of digital audio", IEEE signal processing magazine, 2001) give a review for lossless coding for audio signals.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JIALONG HE whose telephone number is (571)270-5359. The examiner can normally be reached on Monday-Thursday, 7:30 - 5:00, Alt Friday, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benny Tieu can be reached on (571) 272-7490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JH/

/Lewis G. West/
Primary Examiner, Art Unit 2618